CALIFORNIA
WATER PLAN
NEWS

September 1998

Contents Highlights

California Water Plan News is a publication of the Department of Water Resources' statewide planning program. One of the program's major activities is updating the California Water Plan (Bulletin 160) every five years. As part of this work, DWR staff collect and analyze data on land and water use, and forecast future conditions affecting statewide water supplies and demands. This newsletter describes data and forecasting techniques associated with statewide water supply planning. It also provides an overview of conditions or developments influencing planning at the state level. We welcome your questions and comments on material presented here.

California Water Plan News
Division of Planning and Local Assistance
P.O. Box 942836
Sacramento, CA
94236-0001
http://rubicon.water.ca.gov

Jeanine Jones, Chief
Statewide Planning Branch
Division of Planning and Local Assistance
(916) 653-3937

How Does California Compare?

How does California compare with other western states in water planning and water use patterns? California is the most populous of the western states and has by far the greatest water use. Texas comes in second with not quite 60 percent of California's population and approximately 40 to 50 percent California's water use. The population and water use of the remaining western states are much smaller, making Texas the only state suitable for comparison with California.

In 1997, the Texas Water Development Board released a state water plan with a 2050 planning horizon. By 2050, the state's population is expected to increase by almost 90 percent, with a subsequent increase in total water use of 11 percent. Water use for irrigated agriculture is forecasted to decline and urban water use is expected to increase significantly. Urban and agricultural water use were split 33 percent/67 percent in 1994. The forecasted ratio for 2050 is 54 percent urban and 46 percent agricultural. (The Texas plan does not quantify environmental water use.) Agricultural water use is forecasted to decrease due to urban land use conversion and the increased costs of groundwater extraction.

The Texas plan identifies eight new water supply reservoirs and 28 major conveyance projects as being needed by 2050, together with many smaller projects. The plan forecasts a significant shift between groundwater and surface water use by 2050. Groundwater/surface water use was split 57 percent/43 percent in 1994—a ratio expected to change to 31 percent/69 percent in 2050. The expected increase in surface water use reflects an expected decrease in groundwater availability.

(continued on page 11)

Urban Price Elasticity Study

Statewide Planning Branch staff

The relationship of water pricing to water consumption, and the role of pricing in achieving water conservation, has been a subject of increasing interest in recent years. For example, conservation pricing is one of the best management practices contained in the 1991 Memorandum of Understanding Regarding Urban Water Conservation in California. This article summarizes a study on urban price elasticity of demand performed for Bulletin 160-98.

Urban water prices in California vary widely, and are affected by factors such as source of supply, geographic location, and water treatment considerations. Public water supply agencies must balance desires to reduce water use through pricing with desires to provide affordable water rates to consumers. Public agencies set water prices to recover their cost of service, based on the specifics of their service areas. The California Public Utilities Commission reviews rate-setting for investor-owned utilities and establishes the profits that these private companies are allowed to make.

Price elasticity studies are used to characterize price responsiveness—the degree that water users would increase or decrease their use in response to a change in price. The price elasticity of demand is the ratio of the change in the amount of water used to the change in price. Economists define demand as elastic if the absolute value of elasticity is greater than or equal to one. Demand is defined to be inelastic if water users respond only slightly to changes in price (absolute value of elasticity value less than one). Demand is defined to be perfectly inelastic if water users make no change in their use in response to pricing (elasticity value equal to zero). For example, a 1989 East Bay Municipal Utility District study estimated price elasticity of demand for its residential water supply to be -0.20 from 1981 through 1987. This means that a price increase of 10 percent could be expected to lower the amount of water use by about 2 percent. In this example the demand for water was inelastic—residential users were found to be relatively insensitive to price changes over the range of prices evaluated. This has been the typical result for most studies of residential water demand. In another California example, Metropolitan Water District evaluated price elasticity in its service area in a 1990 study. Estimated long-term residential elasticities ranged from -0.29 to -0.36 in the summer and from -0.03 to -0.16 in the winter. (Seasonal differences reflect landscape water use in the warmer months.)

For *Bulletin 160-98*, the Department contracted with University of California researchers for an evaluation of the effects of water pricing and non-pricing demand reduction actions (e.g., public education, rationing, subsidies for adoption of more efficient water use technologies) on urban residential water use. The study covered single-family residential use during 1989 to 1996, a time period incorporating the recent drought and allowing evaluation of actions taken by water purveyors to reduce residential water use during the drought. Eight water retailers whose service areas represent 24 percent of California's population were included—San Francisco Public Utility Commission, Marin Municipal Water

(continued on page 9)

Direct Marketing of Agricultural Products

Barbara Cross is a Supervising Land and Water Use Analyst with the Statewide Planning Branch.

Forecasts of irrigated acreage form the basis for estimating future agricultural water use. Crop markets drive acreage forecasts. This article reviews a segment of the agricultural market often associated with production of specialty crops.

Most California produce is grown and packed by large-scale farming operations for mass market distribution. Many large produce operations are vertically integrated, meaning that one company contracts with growers to produce a crop, packages the crop, and markets and distributes it. Small farming operations may target local markets, often direct farmer-to-consumer sales, because of the production volume and capital needed to participate in wholesale markets. Direct marketing may be the primary or only outlet for many small and medium-sized growers.

Some medium-sized growers use farmers' markets to supplement their incomes and increase cash flow. The U.S. Department of Agriculture publication *1996 National Farmers' Market Directory* lists 2,410 farmers' markets operating in the United States. Some farmers' markets operate seasonally during the harvest months of May through October; others are year-round. Out of 105 year-round markets surveyed by USDA, 21 were in California.

Certified farmers' markets are locations approved by the county agricultural commissioner where farmers offer for sale only those products they grow themselves. California CFMs are operated in accordance with regulations established by the California Department of Food and Agriculture. More than 350 California communities have CFMs. CFMs allow growers to sell field-run produce unrestricted by standardized packing requirements created for wholesale shipping enabling, for example, growers to sell tree-ripened fruit which is too delicate for shipping. CFMs provide growers an outlet suited to moving small volumes of produce outside of the large volume wholesale distribution system.

Other direct marketing approaches include roadside stands and "pick-your-own" operations. The *1995 California Farm Fresh Directory* lists 25 farm trails organizations from Ukiah to Yucaipa, representing hundreds of growers. Growers join farm trails organizations that publicize products available on members' farms through newsletters, maps, and brochures. Farm trails organizations often combine agricultural product marketing with marketing for recreational or tourist activities. For example, the *Coastside Harvest Trails Guide*, sponsored by San Mateo County Farm Bureau, includes details on farms by categories: vegetables, self-pick fruits, pumpkins, fresh flowers and plants, Christmas trees, wineries, and fresh fish and meat. The guide also describes lodging, restaurants, and general stores in the area of the farm trails.

Themed events are another way of helping promote and market specialty crops. Gilroy's garlic festival is probably one of the most well known; however, there are several similar events including the asparagus festival (Stockton) and the zucchini festival (Angels Camp). As the fall season shifts consumers' attention from

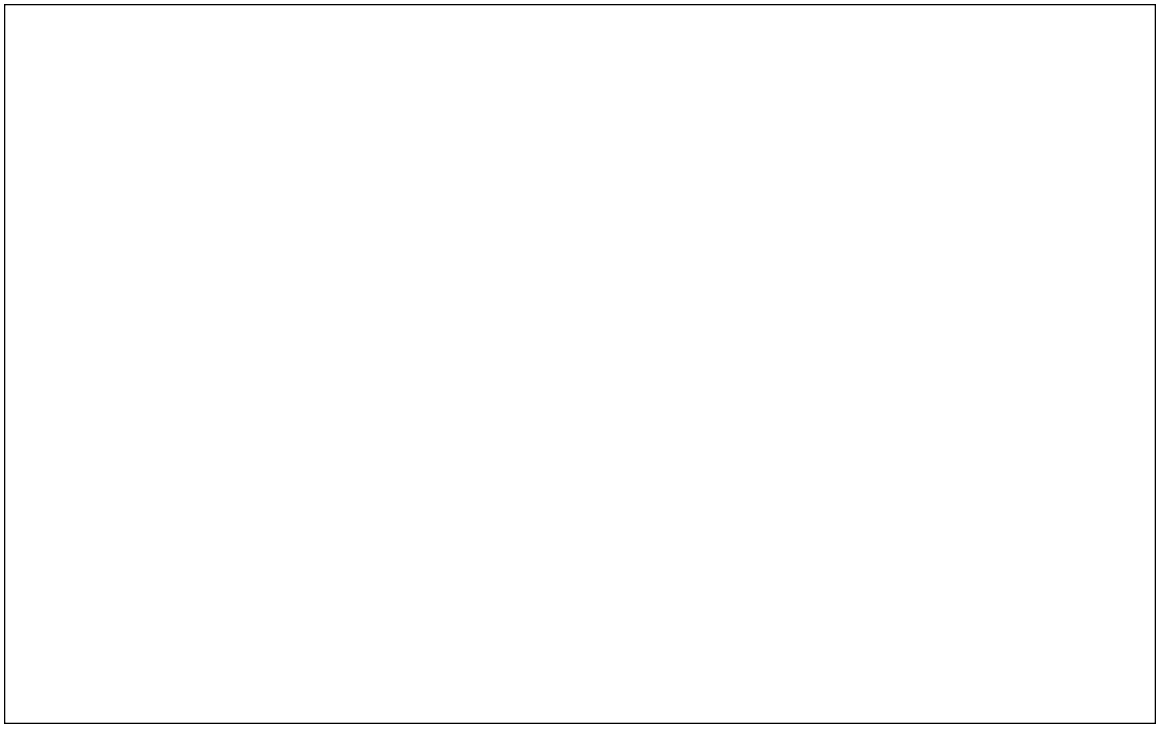
(continued on page 4)

Direct Marketing of Agricultural Products

(continued from page 3)

summer fruits and vegetables to holiday-related crops, themed marketing events or activities involve pumpkins, apples, and Christmas trees. For example, the Half Moon Bay Art and Pumpkin Festival is home to the great pumpkin weigh-off in October. The Apple Hill area in western El Dorado County operates from Labor Day to Christmas, focusing on apple products and Christmas trees. (See sidebar on page 5.)

California farmers' markets, roadside stands, and farm trails are not required to report sales to county agricultural commissioners. Consequently actual revenues are not known. According to the Department of Food and Agriculture, estimated direct marketing revenues are about $200 million annually. One of the largest dollar value farmers' markets is in Santa Monica, California with an estimated $5 million in annual sales. In El Dorado County, the Apple Hill area and other direct marketing outlets are attributed estimated revenues of $64 million, out of $300 million in total El Dorado County 1997 agricultural revenues.



Department of Water Resources photo

Pumpkin patches and Christmas tree farms are examples of specialty markets. In counties with a high percentage of urban development, remaining areas of irrigated agricultural land are often occupied by smaller growers who target niche markets or sell their products through direct marketing.

A Sampling of Themed Events

Event	County
Apple Harvest Festival	Humboldt
Castroville Artichoke Festival	Monterey
Asparagus Festival	San Joaquin
California Dry Bean Festival	San Joaquin
Round Valley Blackberry Festival	Mendocino
Blackberry and Bluegrass Festival	Siskiyou
Carrot Festival	Imperial
San Leandro Cherry Festival	Alameda
Citrus Harvest Festival	San Bernardino
Riverside County Fair and National Date Festival	Riverside
Eggplant Festival Plus	Placer
Lompoc Flower Festival	Santa Barbara
Gilroy Garlic Festival	Santa Clara
Sanger Grape Bowl Festival	Fresno
Lodi Grape Festival & Harvest Fair	San Joaquin
Borrego Springs Grapefruit Festival	San Diego
Morgan Hill Mushroom Mardi Gras	Santa Clara
Mushroom Art Festival	Santa Cruz
Sweet Onion Festival	Imperial
Vacaville Onion Festival	Solano
Onion Festival	Solano
Orange Festival	Ventura
Delta Pear Festival	Sacramento
Kelseyville Pear Festival	Lake
Campbell Prune Festival	Santa Clara
California Prune Festival	Sutter
Calabasas Days Pumpkin Festival	Los Angeles
Pumpkin and Art Festival	San Mateo
Selma Raisin Festival	Fresno
Dinuba Raisin Festival	Tulare
Rice Festival	Sacramento
Strawberry Festival	Santa Barbara
Arroyo Grande Strawberry Festival	San Luis Obispo
Zucchini Festival	Calaveras

Urban Landscaping Data

Statewide Planning Branch staff

As plumbing code changes designed to reduce interior urban residential water use are implemented, a chief potential for additional future urban water conservation lies in reducing exterior urban water use—specifically residential landscape water use. Estimating potential water use reductions from landscape design or irrigation system changes is made difficult by lack of data on irrigated urban landscaping.

The Department's public review draft of *Bulletin 160-98* evaluated potential demand reduction options that urban water agencies might implement by 2020. Options having the potential to generate the largest amount of demand reduction (albeit at a relatively high cost) were associated with landscape water use savings. Many public comments received by the Department correctly pointed out the lack of statewide data on the extent of irrigated urban landscaping. (In contrast, good data on irrigated crop acreage are available at a water agency, county, or statewide level.) In response to those comments, the Department has changed the Bulletin's method for calculating potential future landscape water savings to an approach that does not involve forecasting acreage.

Water conservation planners often focus on calculation methods that involve landscape acreage. Only a handful of water districts in California have actual or estimated data on the extent of irrigated landscaping in their service areas. Estimating the acreage of so-called "large landscaping"—major turf areas such as parks, golf courses, and cemeteries—within a retail agency's boundaries is easiest. Large areas may be quantified from information gained through air photo interpretation, parcel maps, or site visits. The major difficulty lies in estimating acreage of irrigated residential and smaller commercial landscaping.

Water agencies are beginning to evaluate cost-effective ways to quantify landscaped areas. The California Urban Water Conservation Council, for instance, is developing a workbook on landscape acreage measurement/estimation. Measurement options potentially include use of satellite imagery or air photos, estimated ratios from parcel maps, surveys, or questionnaires to property owners. There are drawbacks to all of these approaches. In satellite imagery interpretation, vegetated areas may represent a combination of tree canopy and turf, or may represent only tree canopy—how should water use be calculated for this condition? Estimates of ratios of landscaped acreage to total urban acreage are highly site-specific, varying even within one water agency's or municipality's boundaries. The Department has reviewed ratios of landscaped acreage to total urban acreage from its county land use surveys. These ratios have ranged from percentages in the low teens to almost 40 percent.

As more water agencies quantify their urban landscape acreage, planners will be able to better estimate potential conservation savings from actions such as more efficient irrigation practices or changes in landscaping composition.

Shared Interests in the San Joaquin River Basin below Friant Dam

Paula Landis is a Program Manager with the U.S. Bureau of Reclamation's South-Central California Area Office

USBR is involved in several San Joaquin River management activities. The 1995 San Joaquin River Management Plan described below summarized conditions on the river by expressing that "The San Joaquin River is no longer able to satisfy the many demands placed on it. ... New approaches are needed to help maintain the health of the river systems while meeting demands." This article summarizes several programs trying new approaches.

The San Joaquin River Management Program was created in 1990 by State legislation that charged an advisory council with identifying actions that could be taken to benefit uses of the system. The program's objective was to "develop compatible solutions to water supply, water quality, flood protection, fisheries, wildlife habitat, and recreation needs." The geographic reach covered by the SJRMP program was the San Joaquin River from Friant Dam downstream through the northern boundary of the South Delta Water Agency; the Merced, Tuolumne, and Stanislaus Rivers from their confluence with the San Joaquin upstream to the first major dam on these tributaries; and the North Fork of the Kings River. SJRMP prepared a plan for the Resources Agency in 1995 which identified nearly 80 actions that could be taken to benefit uses of the river. Additional State legislation in that year authorized SJRMP to seek implementation of actions recommended in the plan, and to coordinate its activities with Central Valley Project Improvement Act programs.

The San Joaquin River Riparian Habitat Restoration Program is focused on 150 miles of the San Joaquin River corridor from Friant Dam to the Merced River confluence. The Friant Water Users Authority, Natural Resources Defense Council, and Pacific Coast Federation of Fishermen's Associations have agreed to pursue mutually acceptable restoration activities. Initially, the group has agreed to work on riparian habitat restoration along this150-mile reach. The objective of SJRRHRP is to develop and implement a plan for restoration of a continuous riparian corridor in the study reach and to construct riparian habitat restoration projects. The plan is to establish a series of priority actions.

The idea for the SJRRHRP grew out of a conflict surrounding a 1988 federal district court lawsuit filed by NRDC against USBR challenging renewal of Friant Division water service contracts. In January 1997, the district court ruled that 14 contracts renewed prior to passage of CVPIA were void, a ruling upheld in 1998 by the Ninth Circuit Court of Appeals. FWUA and NRDC recognized that positive results could be achieved for the river if they worked together outside of the litigation.

State legislation established the San Joaquin River Conservancy and charged it with acquiring and managing public lands within the San Joaquin River Parkway. The parkway includes the San Joaquin River and about 5,900 acres of land on both sides of the river. The parkway stretches about 22 miles from Friant Dam downstream to the Highway 99 crossing of the river. The parkway is planned as a riparian corridor with trails for hiking, horseback riding, and

(continued on page 11)

Prado Basin Wetlands Project

Katherine O'Connor is a Senior Environmental Specialist with Orange County Water District.

Groundwater is the major source of local supply in Orange County. Orange County Water District is involved in a variety of groundwater supply and groundwater quality management programs. This article describes use of a constructed wetlands to reduce nitrogen concentrations in recharge water.

The Santa Ana River has its headwaters in the San Bernardino Mountains below the Big Bear Lake area. The river flows through parts of San Bernardino and Riverside Counties, entering the Prado Flood Control Basin just upstream of the Riverside County/Orange County line. Downstream, the lower river is channelized for almost all of its length throughout the highly urbanized part of Orange County. Santa Ana River water provides much of the recharge for Orange County's coastal plain groundwater basin.

The U.S. Army Corps of Engineers' Prado Dam is the primary flood control facility on the Santa Ana River, impounding 188,000 acre-feet of flood control storage. The dam was originally designed to operate as a flood control detention facility, maintaining a conservation storage pool of only 10,000 AF. Orange County Water District subsequently entered into an agreement with USACE and the U.S. Fish and Wildlife Service to allow conservation storage of 25,750 AF. The stored water is managed by OCWD for groundwater recharge.

OCWD owns 2,150 acres in the flood control basin behind the dam, where it operates a constructed freshwater wetlands system for nitrogen removal. The wetlands, covering about 465 acres, consist of a network of shallow ponds. Operation of the wetlands began in 1992. The Santa Ana River is a wastewater dominated stream for much of the year, typically high in total dissolved solids and nitrogen. River nitrate concentrations may exceed 10 mg/l. During summer months, the wetlands can reduce nitrates to below detection levels, while the winter reduction rate is about 60 percent. Because Santa Ana River water is used for recharge downstream, improving river water quality is important.

Future urban development in the upstream watershed is expected to increase wastewater discharges to the river. In 1997 the Prado wetlands were rebuilt in anticipation of increased flows and to improve their operating efficiency. The $2.5 million reconstruction increased the hydraulic capacity of the pond system, modified the ponds to enhance biochemical nitrogen removal, and improved operational flexibility of the wetlands.

The Prado wetlands provide habitat for two bird species listed under the federal Endangered Species Act—the least Bell's vireo and the southwestern willow flycatcher. As part of its agreement with USACE and USFWS, OCWD set aside more than 226 acres as habitat for these species, and funded more than $1 million for mitigation and monitoring for the vireo. When the three agencies first began negotiating the agreement in 1986, there were 19 pairs of nesting vireos in the flood control basin. Today there are more than 200 nesting pairs. OCWD also provided $1 million to USFWS to remove giant reed (*Arundo donax)* from the flood control basin. This invasive plant had overrun the basin and reduced its habitat value.

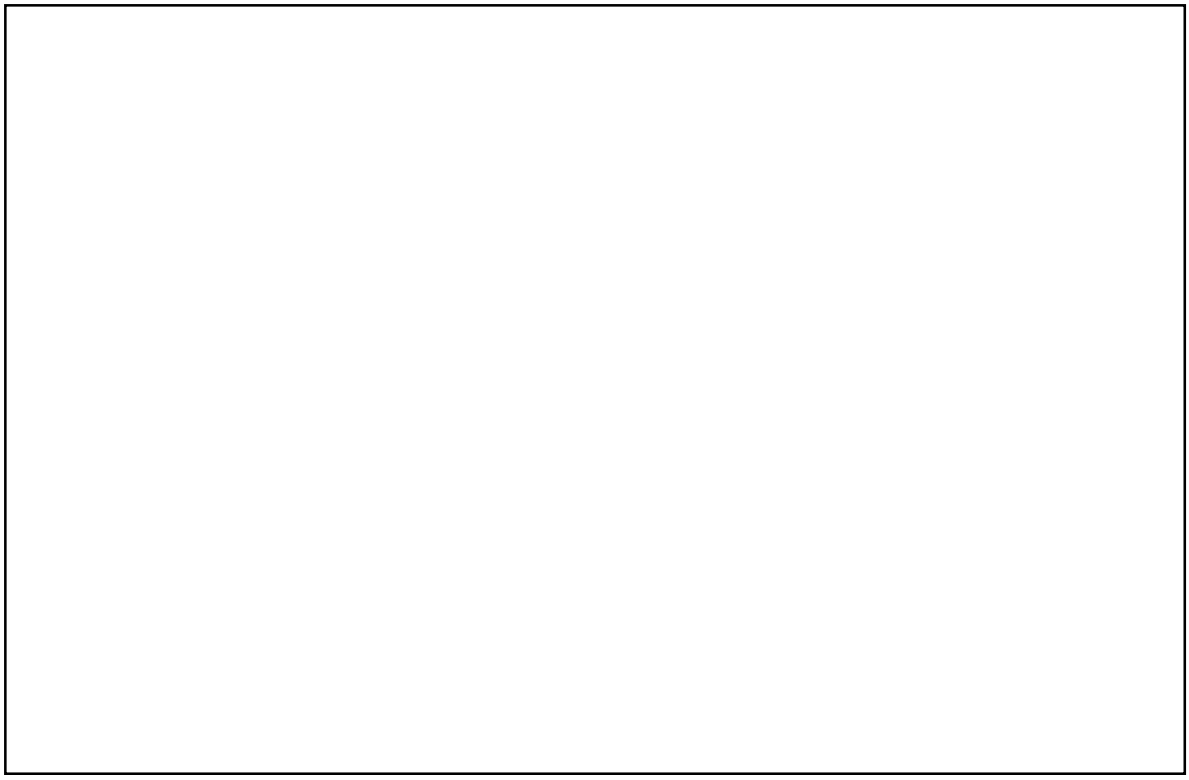


Photo credit: Orange County Water District

An aerial view of the wetlands behind Prado Dam.

Urban Price Elasticity Study

(continued from page 2)

District, Contra Costa Water District, EBMUD, City of San Bernardino, City of Santa Barbara, Los Angeles Department of Water and Power, and City of San Diego. All of these agencies experienced price increases over the study period and all additionally used non-pricing demand reduction actions during the study period. Price elasticity (year-round) was estimated to be -0.16 (meaning that a 10 percent price increase would result in a 1.6 percent demand reduction) over a range of marginal prices of $0.47 to $4.25 per hundred cubic feet ($205 to $1,851 per acre-foot). For summer months the elasticity estimate increased to -0.20, reflecting landscape water use. Both elasticity estimates excluded the effects of non-pricing demand reduction actions. These results are consistent with other urban residential water use studies that show price to have only minor effects on water use at current levels of water pricing.

Copies of this study may be obtained from Ray Hoagland, Chief of the Department's Economic Analysis and Financial Assistance Section, at (916) 653-6785.

Crystal Springs Reservoir

Statewide Planning Branch staff compiled this article from information provided by the San Francisco Public Utilities Commission

Preparing the California Water Plan Update entails fact-checking information presented in the report, especially information pertaining to water agencies' facilities and water supply sources. This historical review of the construction of Crystal Springs Reservoir originated in the question, "If there is an Upper Crystal Springs Reservoir and a Lower Crystal Springs Reservoir, why do our records show only one dam?"

Upper and Lower Crystal Springs Reservoirs are located adjacent to Highway 280 in San Mateo County in a valley on the San Andreas rift zone. The City and County of San Francisco owns the surrounding watershed, which is managed to protect the reservoirs' water quality. This park-like area about 15 miles south of San Francisco is a popular recreational destination. San Francisco's property also includes Pilarcitos Dam on Pilarcitos Creek to the west, which was developed for the City's water supply in the 1870s, and San Andreas Dam forming San Andreas Lake immediately north of Crystal Springs on the rift zone.

Upper Crystal Springs Reservoir was the original terminus for Hetch Hetchy Aqueduct water conveyed from Yosemite National Park to the San Francisco peninsula. Upper Crystal Springs Dam, located about three miles from the southern end of the reservoir, divided the reservoir into two parts. The dam, an 1876 earthfill structure with a puddled clay core, was 70 feet high and was built across the San Andreas rift zone. Since 1923 the dam has supported the roadbed for Highway 92 to Half Moon Bay and has no longer functioned as a dam. The former dam's outlets works were a brick-lined tunnel containing a 42-inch diameter pipe. The tunnel was damaged during the 1906 San Francisco earthquake; about 20 feet of pipeline were fractured by a lateral earth movement of 5.5 feet. The outlet works were modified to provide unregulated flow between the upper and lower reservoirs when the dam was converted to a highway embankment.

Lower Crystal Springs Dam is a concrete gravity dam constructed in 1888 and later raised to its present height. Lower Crystal Springs is located parallel to the rift zone, and spans a small gap in the side of the valley. Most Hetch Hetchy Aqueduct water now bypasses the Crystal Springs Reservoirs via a pipeline transmission system constructed subsequent to San Francisco's early development of reservoir sites on the peninsula.

Shared Interests in the San Joaquin River Basin below Friant Dam

(continued from page 7)

biking; boating access points; wildlife areas; and education areas. Approximately 1,900 acres are located in Madera County and 4,000 acres in Fresno County, of which approximately 1,600 acres are in public ownership.

A conceptual plan for development of the parkway was drafted in 1992 by a task force consisting of representatives from 25 agencies and interest groups. The goal of the Conservancy is to preserve and enhance the San Joaquin River's extraordinary biological diversity, protect its valued cultural and natural resources, and provide educational and recreational opportunities to local communities. The Conservancy is governed by a 13-member board which includes representatives from Madera and Fresno Counties, the Cities of Fresno and Madera, members from the general public, and from State and local agencies. The Conservancy is to manage parkway lands to provide a harmonious combination of low-impact recreational and educational uses, and wildlife protection.

The San Joaquin River Parkway and Conservation Trust, a nonprofit land trust formed in 1988, has acquired approximately 490 acres of river bottom land and has assisted the California Wildlife Conservation Board and the Conservancy in acquiring an additional 550 acres. In addition to securing land acquisition funding, the Parkway Trust has been awarded grants for trail conservation, habitat restoration projects, and environmental education programs. To date, five miles of paved multi-use trail have been completed and are being well used, approximately 40 acres of new riparian forest is emerging, and more than 10,000 school children learn about the San Joaquin River each year.

How Does California Compare?

(continued from page 1)

Drought management is a major concern in Texas. Even short duration droughts of one to two years cause hardships. Parts of Texas are experiencing drought now; the state's 1996 drought was the most severe since Texas' drought of record in 1950-57. The state's groundwater resources are not immune to short-duration droughts. Karstic limestone deposits constitute an important share of the state's aquifer systems; water levels in these aquifers respond rapidly to a lack of rainfall.

Most of the plan's proposed major conveyance projects would be located in the eastern (wetter) part of the state; about half would entail conveyance of water from one river basin to another. There has been relatively little activity on water marketing in Texas, reflecting the state's historic reliance on groundwater use and the paucity of interbasin surface water projects. In comparison to California, Texas has relatively little surface water development and does not have facilities to make significant inter-regional transfers of water. The Texas plan does not explicitly address water marketing as a future option.

Jeanine Jones, Chief
Statewide Planning Branch

CALIFORNIA WATER PLAN NEWS

State of California
The Resources Agency
Department of Water Resources

Division of Planning and Local Assistance
P.O. Box 942836
Sacramento, CA
94236-0001

ADDRESS CORRECTION REQUESTED

Statewide Statistics

California Population by Decade

1900	1,485,053	1940	6,907,387	1980	23,667,902
1910	2,377,549	1950	10,586,233	1990	29,760,021
1920	3,426,861	1960	15,717,204	2000*	34,704,000
1930	5,677,251	1970	19,971,069		

*Department of Finance projection